OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN DECEMBER:—

December 9. 12h. 14m. Minimum of Algol (β Persei).
10-12. Epoch of Geminid meteoric shower (radiant 106°+33°).
12. 9h. 3m. Minimum of Algol (β Persei).
15. 2h. 48m. to 3h. 34m. Occultation of the star κ^2 Tauri (mag. 5·5) by the moon.
15. 2h. 55m. to 3h. 27m. Occultation of the star κ^1 Tauri (mag. 4·6) by the moon.
15. 5h. 52m. Minimum of Algol (β Persei).
15. Venus. Illuminated portion of disc = 0·928.
15. Mars. Illuminated portion of disc = 0·998.
16. Partial eclipse of the moon.
11h. 45m. First contact with shadow.
13h. 26h. Middle of the eclipse.
15h. 7m. Last contact with shadow.
Magnitude of the eclipse = 0·995.
16. 15h. 36m. to 16h. 11m. Occultation of Neptune by the moon.
17. 5h. Neptune in opposition to the sun.
18. 18h. 31m. to 19h. 9m. Occultation of f Geminorum (mag. 5·2) by the moon.
20. Jupiter 9° W. of Mercury, on Dec. 24, 11°, and on Dec. 27, 14°.
21. Saturn. Outer minor axis outer ring = 15″·76.
21. 18h. 4m. Transit of Jupiter's Sat. III. Egress.
22. 17h. Mercury in conjunction with Uranus (Mercury 2° 17′ N.).
25. 1h. Mercury at greatest elongation (22° 5′ W.).
25. 14h. 39m. to 15h. 47m. Occultation of the star D.M. − 10°, 3570 (mag. 6) by the moon.
26. 16h. 22m. to 17h. 3m. Occultation of the star 83 Virginis (mag. 5·8) by the moon.
29. 7 a.m. Jupiter, 6° E. of the moon.
30. ,, ,, 8° W.N.W. of the moon.
31. ,, Mercury, 5° W.N.W. of the moon.

The red spot on Jupiter will be about central on Dec. 21, 7.44 a.m.; Dec. 26, 6.54 a.m., and Dec. 28, 8.33 a.m.

MERCURY AND JUPITER AS MORNING STARS.—In the dark mornings of December it is almost as convenient for amateurs to effect observations of celestial objects as it is in the evening hours. It may therefore be of interest to mention that at about Christmas time Mercury and Jupiter will be favourably visible above the S.E. horizon just before sunrise, and that the crescent of the moon will be placed near these planets on the last three mornings of 1899. The following are the times of rising of Jupiter, Mercury and the sun on thirteen days:—

	♃ rises. h. m.	☿ rises. h. m.	☉ rises. h. m.
Dec. 18	5 36 a.m.	6 7 a.m.	8 3 a.m.
19	5 33	6 6	8 4
20	5 30	6 5	8 4
21	5 27	6 5	8 5
22	5 24	6 6	8 5
23	5 21	6 8	8 6
24	5 19	6 9	8 6
25	5 16	6 11	8 7
26	5 13	6 12	8 7
27	5 10	6 14	8 7
28	5 8	6 17	8 8
29	5 5	6 20	8 8
30	5 2	6 24	8 8

HOLMES' COMET (1899 *d*).

Ephemeris for 12h. Greenwich Mean Time.

1899.	R.A. h. m. s.	Decl. ° ′ ″
Dec. 7	2 5 48·62	+45 44 16·0
8	5 30·45	35 24·2
9	5 14·52	26 31·2
10	5 0·82	17 37·6
11	4 49·35	45 8 43·8
12	4 40·08	44 59 50·6
13	4 32·99	44 50 58·3
14	4 28·08	+44 42 7·4

COMET GIACOBINI (1899 *e*).

Ephemeris for 12h. Berlin Mean Time.

1899.	R.A. h. m. s.	Decl. ° ′	Br.
Dec. 7	18 16 7	+14 13·0	
8	17 50	14 30·4	0·42
9	19 33	14 47·8	
10	21 17	15 5 4	0·41
11	23 0	15 23·0	
12	24 44	15 40·7	0·40
13	26 29	15 58·5	
14	18 28 13	+16 16·4	

SPECTRUM OF P. CYGNI.—Herr A. Belopolsky has recently obtained several photographs of the spectrum of the variable star P Cygni (mag. 5), and states the results of his measurements in the *Astronomische Nachrichten* (Bd. 150, No. 3603). The instrument used was the two-prism spectrograph (camera 25 cm. long) attached to the 30-inch refractor of the Pulkowa Observatory. Both bright and dark lines are given, and it is noted that while the *bright* lines generally occupy a normal position, the *dark* lines are displaced towards the violet or more refrangible end of the spectrum. It is also interesting to note that several of the lines found are ascribed to nitrogen. The following table gives the wave-lengths of the lines in the star's spectrum with their probable origins:—

Bright Lines.	Dark Lines.	Wave Length Rowland, Runge, Neovius.	Origin.
4861·6	4858·2	4861·5	Hβ
4713·5	4711·0	4713·3	Helium
—	4648·3	4651·0	N
—	4640·8	4643·4, 4640·5	N
4631·5	4629·2	4630·9	N
—	4620·3	4622·0	N
—	4606·2	4607·2	N
4601·9	—	4601·3	N
—	4561·7	—	?
—	4551·7	—	?
4472·1	4469·6	4471·8	Helium
4420·1	—	—	?
4396·1	—	—	?
—	4386·7	4388·1	Helium
4345·7	4344·8	—	?
4340·8	4338·1	4340·7	Hγ

ANNIVERSARY MEETING OF THE ROYAL SOCIETY.

FOLLOWING the usual custom, the anniversary meeting of the Royal Society was held in the apartments of the Society at Burlington House on St. Andrew's Day, November 30. The auditors of the Treasurer's accounts read their report, and the Secretary read the list of Fellows elected and deceased since the last anniversary. The President, in his anniversary address, referred to M. Haffkine's experience and views regarding preventive inoculation, and then proceeded to the award of the medals.

COPLEY MEDAL.

The Copley Medal is conferred upon Lord Rayleigh for his splendid services to Physics.

Lord Rayleigh's investigations have increased our knowledge of almost every department of physical science, covering the experimental as well as the mathematical parts of the subject. Acoustics, optics, electricity, and magnetism, the molecular theory of the constitution of bodies, the theory of elasticity, the composition of the atmosphere, are but a selection from the subjects of his investigations. In acoustics he has added to our knowledge of resonance (the subject of his first paper in the *Philosophical Transactions*), the behaviour of singing flames, the vibrations of jets, the general theory of the vibrations of dynamical systems, while his masterly "Theory of Sound" has thrown light on and given unity to the whole of the subject. In optics, his researches include the theory of the scattering of light by small particles, with its application to the explanation of the blue of the sky, anomalous dispersion, the nature of white light, reflection from crystals, and the general theory of optical instruments. In electricity and magnetism, in addition to theoretical investigations of great importance on the distribution

of alternating currents in conductors, he has made, in co-operation with Mrs. Sidgwick, those classical investigations of the value of the ohm in absolute measure, the electromotive force of the Clark cell, the electrochemical equivalent of silver, and the specific resistance of mercury. His researches on the theory of elasticity are valued by all students of mathematical physics. In his researches on the density of gases he met with small discrepancies between the density of nitrogen derived from the air and that derived from chemical compounds. Investigations into the cause of this discrepancy, followed up with wonderful skill and perseverance, led to the discovery of a new element (argon) existing in large quantities in the atmosphere, and possessing qualities of a very novel and remarkable kind. Lord Rayleigh's researches, from the range of subjects they cover, their abundance and their importance, have rarely been paralleled in the history of physical science.

ROYAL MEDALS.

One of the Royal Medals is conferred upon Prof. G. F. Fitzgerald, for his brilliant contributions to Physics.

A foremost position has been occupied by Prof. G. F. Fitzgerald during the last twenty years in the domain of Radiation and Electrical Theory. At the time when very few people had definite notions of the changed aspects which these subjects had assumed after Maxwell's theoretical advances, he was prominent as an expositor and developer of the new views. Thus his paper on "Electromagnetic Effects due to the Motion of the Earth" (*Trans. Roy. Dub. Soc.*, May 1882) was, perhaps, the earliest explicit effort to bring the facts regarding the astronomical aberration of light and general optical knowledge as to the relation of the æther to moving matter, into relation to electrical theory. Enough was there established, in both the optical and the purely electrodynamic domain, to show that no fundamental discrepancy was to be anticipated in the new point of view. Again, his paper "On the Quantity of Energy transferred to the Æther by a Variable Current" (*loc. cit.* November 1883), forms probably the earliest investigation of the field of an electric radiator. The case explored is that of a uniform current of periodically varying intensity; but the historical significance of the investigation is not impaired by the circumstance that subsequent research has transferred the source of actual radiation to the oscillations of the ions in the molecule. Already, in the preceding year, reflecting that crucial evidence with regard to the new standpoint of Maxwell was probably to be sought only in the domain of radiation, he had pointed to the oscillatory electric discharge in a condenser as a means of obtaining actual electric radiation, if only the period of the oscillations could be sufficiently reduced. Reference may also be made to the paper "On a Model illustrating the Properties of the Æther" (*Proc. Roy. Dub. Soc.*, January 1885), which has been widely useful, owing to the very simple manner in which the model—which is on the principle of Maxwell's own idle-wheel representation—visualises a large range of relations of the æther that had previously been amenable only to abstruse mathematical representation.

At an earlier period, Prof. Fitzgerald was occupied with magneto-optic phenomena, particularly with the theoretical bearing of Dr. Kerr's then recent discovery of the peculiarity in the reflection of light from a magnetised substance. That subject is considered at length, with restrictions, however, to transparent media in the analysis, in the latter half of the memoir, "On the Electromagnetic Theory of the Reflection and Refraction of Light" (*Phil. Trans.*, 1879). But the main interest of this memoir consists, perhaps, in the dynamical formulation of the electric theory of light on the basis of the Principle of Least Action, and in the comparison of that theory with the optical work of the author's countryman, MacCullagh. He has thereby contributed to a broader appreciation of that writer's position, and has shown that his theory of light, which was reached inductively along purely optical lines, runs parallel, and is, in fact, identical with the theory of Maxwell which presented itself in the course of a far wider induction originating in the domain of electrodynamics. The remark with which this memoir concludes, as to the advantage of "emancipating our minds from the thraldom of a material æther," has not, perhaps, yet lost all its force.

Not the least of Prof. Fitzgerald's services has been his success in guiding and energising an Irish School of Natural Philosophy. His efforts, and those of his pupils, have had a prominent share in the development and illustration in this country of the phenomena of electric radiation. Thus, in 1889, he was engaged, with Mr. F. T. Trouton, in verifying the laws of polarisation, by reflection, for Hertzian radiation; in 1890, he brought forward a new means of detecting such radiation by a galvanometer inserted across the spark-gap; in 1892 he returns to the problem of practical electric vibrators by a series of suggestions as to ways in which a continuous vibration of the requisite high frequency might possibly be established. He has experimented, with Dr. Trouton, in 1896, on the scattering of Röntgen radiation in passing through paraffin; and, along with Mr. W. E. Wilson, he has conducted a research on the effect of the pressure of the surrounding atmosphere on the temperature of the electric arc, which must have important bearings on the theory of radiation from solid bodies. He has also completed the work of Maxwell and Chrystal on Ohm's law of conduction by minutely testing its validity for the case of electrolytes.

More recently his efforts have contributed to the elucidation of the modifications impressed on the lines of a radiant spectrum, by change of pressure of the atmosphere surrounding the radiator, and by a field of magnetic force.

His critical activity pervades an unbounded field, enlivened and enriched throughout by the fruits of a luxuriant imagination.

The other Royal Medal is given to Prof. William Carmichael McIntosh for his very important labours as a zoologist.

Prof. McIntosh may be regarded as one of a distinguished succession of monographers of the British Fauna who, beginning with Edward Forbes, have during the last fifty years done work highly creditable to British Zoology.

McIntosh's great monograph of the British Annelids, published by the Ray Society, is still in progress. Two folio volumes appeared more than twenty years ago, a third is now in the press, and a final volume is contemplated. As a result of this work, and of numerous papers on the subject, McIntosh is justly regarded as the European authority on this group of animals. But his work has by no means been wholly that of a systematist. He is the author of one of the large and important *Challenger* Reports (that on the Polychæta), and of several minor reports of the same and other Government expeditions. His other papers extend over a wide range of subjects, and deal with many structural points. His name, moreover, is associated with the discovery or the description of several of the more remarkable or problematical of marine animals—such as *Pelonaia*, *Phoronis*, and *Cephalodiscus*.

Some of Prof. McIntosh's earlier papers were on fishes and their life history, and during the last ten or twelve years he has returned to that subject, and has added to the knowledge of our sea fisheries to a remarkable extent—both by observations anatomical and embryological (published in the *Trans. Roy. Soc. Edin.*), and in his book on British marine fishes, and by experiments on a large scale calculated to yield results of industrial importance.

Finally, Prof. McIntosh has been a notable teacher in Scotland, and many of those he has trained now occupy zoological posts and have conducted important researches. He is himself still a very active worker, both in his own investigations and in directing the researches of others. He was the first to found a marine biological station in this country, and the establishment of the present well-known Gatty Marine Laboratory at St. Andrews is entirely the outcome of his energy and influence.

DAVY MEDAL.

The Davy Medal is bestowed upon Edward Schunck for researches of very high importance in Organic Chemistry.

Edward Schunck is the author of a remarkable series of contributions to the chemistry of vegetable colouring matters, dating from 1841 up to the present time, and it is noteworthy that his first English paper appeared in the first volume of memoirs issued by the Chemical Society of London.

His earlier work includes two investigations which are everywhere regarded as classical, the one relating to the Madder plant, the other to the Indigo plant, from which the two most important dye-stuffs known to us are derived. In these, besides establishing the fact that the colouring matters are not present as such in the plant, but as glucosides, he brought to light much other information of importance in relation both to alizarin and indigo, and to allied substances with which they are associated.

In 1871, by his discovery of anthroplavic acid in artificial alizarin, he gave an important impetus to the further study of

the dye products of the manufacture of this substance, and thus contributed to a development of the industry which soon became of the utmost consequence.

Of late years he has devoted himself to the study of the green colouring matter of plants, and has contributed a series of remarkable papers to the Royal Society on the "Chemistry of Chlorophyll." These deal with one of the most difficult and at the same time most interesting chapters in the whole range of organic chemistry; they are full of observations of fundamental importance, and will serve as a sure foundation for all future researches on the subject. For the first time Schunck has succeeded in obtaining well-defined crystal-like products bearing a close relationship to the natural substance. Nowhere is his remarkable skill as a manipulator, his extreme delicacy of touch, more apparent than in this his latest work.

The Society next proceeded to elect the officers and Council for the ensuing year. The list of Fellows recommended for election has already been given (p. 38), and the only change was the substitution of the name of the Right Hon. James Bryce, M.P., for that of Sir John Murray.

The following are some of the subjects dealt with in the Council's Report:—

ASSOCIATION OF ACADEMIES.

With reference to the proposal for an International Association of Scientific Academies, mentioned in the Council's last Report, letters have been received from the Académie des Sciences, the Lincei at Rome, and the Imperial Academy of Sciences at St. Petersburg, expressing their approval of the suggestion and their readiness to join such an organisation. A preliminary Conference was held at Wiesbaden on October 9, to which the two Secretaries, with Prof. Armstrong and Prof. Schuster, were appointed as delegates from the Royal Society (the Senior Secretary was, however, unable to attend). The Conference exhibited the most perfect accord in the desire to further the practical establishment of an Association for the purpose in view, and proposed a draft scheme for the organisation of the Association on the following lines:—

(1) The Association shall consist of a General Assembly and a Council.

(2) The General Assembly shall consist of delegates appointed by the constituent Academies, each Academy having the right to appoint as many delegates as it may think necessary. On matters of organisation, each Academy shall have but one vote. No Academy shall be bound to take part in enterprises approved by the Association.

(3) The Assembly shall meet once every three years, but under specified conditions the time of such meeting may be altered.

(4) The Assembly shall be divided into two sections, for Natural Science and for Literature and Philosophy respectively. These sections shall have the right of separate meeting. Decisions arrived at by them shall be reported to the General Assembly for information, and, in case the decisions affect both sections, for confirmation.

(5) In the interval between the meetings of the General Assembly, the affairs of the Association shall be managed by a Council, to which each Academy shall send one or two representatives according as it belongs to one or both sections. In either case each Academy will have but one vote. The Council will have a President and a Vice-President, who must belong to different sections.

INTERNATIONAL CATALOGUE OF SCIENTIFIC LITERATURE.

The Second International Conference, held in the Society's rooms in October, 1898, appointed a Provisional International Committee, which was to consider reports on various questions discussed at the Conference, to be obtained by the Delegates to the Conference from local committees in their several countries.

The Committee met in the Society's rooms on August 1–5, those present being Prof. Armstrong, Sir M. Foster, Prof. Klein, M. Köppen and Profs. Poincaré, Rücker, Schwalbe and Weiss.

At the close of a series of very arduous sittings, during which questions of great difficulty and delicacy were discussed, a Report was agreed to; and in accordance with the decision of the second Conference, this has been issued by the Royal Society to the various Governments concerned, and will in due course be considered by the Council of the Society.

It should be mentioned that it was agreed to recommend: "That an International Conference, to arrive at a final decision on all matters concerning the catalogue, be held at Eastertide, 1900."

NATIONAL PHYSICAL LABORATORY.

The questions of detail concerning the establishment of this Institution, mentioned in the Council's last Report, having been settled with H.M. Treasury, a scheme of organisation prepared by a Committee of the Council has been approved by the Lords Commissioners of the Treasury. Under this scheme the Kew Observatory Committee, as at present constituted, will cease to exist, and will be incorporated with the National Physical Laboratory, but six members of the Committee have been appointed to serve for a definite period on the Executive.

The ultimate control of the Laboratory will be placed in the hands of the President and Council of the Royal Society, and the income and all other property will be vested in the Royal Society. The Governing Body will consist of a General Board and an Executive Committee, the former composed of the Officers of the Royal Society, the Permanent Secretary of the Board of Trade, twenty-four nominees of the Council, and twelve members nominated by the Councils of the six leading technical Societies, viz. The Institution of Civil Engineers; the Institution of Mechanical Engineers; the Institution of Electrical Engineers; the Iron and Steel Institute; the Institution of Naval Architects; and the Society of Chemical Industry.

The Council, on the recommendation of the Executive Committee, have appointed Mr. R. T. Glazebrook, F.R.S., to the Directorship of the Laboratory, and he will assume the duties of that post on January 1, next year. In the meantime, a number of sub-committees have been appointed to advise the Executive with regard to important questions as to the nature of the work to be undertaken in the Laboratory. Upon their Reports must depend largely the decision which will be taken by the Executive with regard to the buildings for the Laboratory and their site, subjects which are engaging the earnest attention of the Committee.

PROTECTION OF ROYAL OBSERVATORIES.

The protection of Royal Observatories from the effects of magnetic influence, referred to in the Council's last Report, having received the attention of the Government, delegates were appointed at the invitation of the Treasury to represent the Council at a conference of the officers of that Department. After some discussion, a model clause has received the sanction of the Chairmen of the Committees of the Houses of Lords and Commons respectively, and has been introduced into the Bills which were passed during the last Session of Parliament, for electric railways or tramways in the neighbourhood of London.

Under this clause, any Government Department which desires protection against the electrical or magnetic disturbances produced by electric railways or tramways will be at liberty to appeal to the Board of Trade, which will have power to decide whether the return conductor shall be insulated, or what other precautions shall be adopted.

SCIENTIFIC ADVICE TO THE GOVERNMENT OF INDIA.

Early in the year a letter was received from the India Office relating to scientific inquiry in India, and stating that, when the question had arisen of devising a scheme of investigation, the responsibility of suggestions had usually fallen on officials who were not competent to give advice. The Government of India suggested that they should have the advantage of the advice of leading men of science in England, who would exercise a general control over researches instituted by the Government. Lord George Hamilton having inquired whether the Royal Society would be willing to meet the wishes of the Indian Government by assisting in this capacity, the Council decided to appoint a Standing Committee to give such advice as it can on matters connected with scientific inquiry in India. Since the researches on which such a Committee would be consulted would probably in most instances refer to biological matters, the Committee has been chosen chiefly from among the biological Fellows.

The Committee thus constituted has a parallel in the Indian Observatories Committee established at the request of the Government some time since, and mentioned in various Reports of the Council.

CHELSEA PHYSIC GARDEN.

Towards the end of last year the Council received from the Charity Commissioners a request for their views upon a scheme

which, at the request of the Society of Apothecaries, the Commissioners had drawn up for the future government of the Chelsea Physic Garden, in the ownership of which the Royal Society had by the deed of grant of Sir Hans Sloane, a reversionary interest. The Council appointed a Committee to consider the Charity Commissioners' scheme, and this Committee having reported to the Council in favour of the scheme, with certain amendments which the Charity Commissioners expressed their willingness to adopt, the Council have concurred in the scheme, which provides for the maintenance of the Garden, under the Charitable Trusts Acts, for the purposes of botanical study, and gives to the Royal Society, among other Institutions, a representation upon the Committee of Management.

"PRIVILEGED" CANDIDATES FOR FELLOWSHIP.

The attention of the Council having been drawn to the regulations governing the election of Fellows under privileged conditions, a Committee was appointed early in the year to consider whether any alteration in them would be desirable. The Committee have duly reported, and, in accordance with their report, the Council have under consideration a modification of the Statutes, enabling the Council to recommend to the Society for election persons who either are Members of Her Majesty's Privy Council, or have rendered signal service to the cause of science, provided that not more than three such persons shall be elected in any one year, the persons so recommended to be selected by the Council by ballot in accordance with a procedure to be established by Standing Orders of Council. The Standing Orders which the Council propose to make correspond in the main with the procedure for the adjudication of the medals, but are still more stringent in character.

In the evening the Fellows and their friends dined together at the Whitehall Rooms.

STEREOCHEMISTRY AND PHYSIOLOGY.

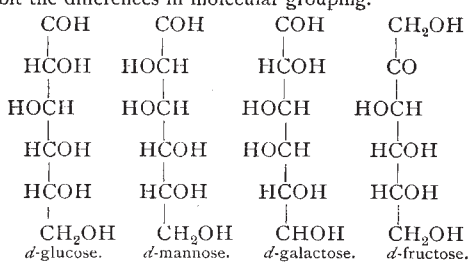
IN a recent number of the *Zeitschrift für physiologische Chemie*, Prof. Emil Fischer has reviewed the facts by which, in conjunction with Thierfelder, he has sought to explain the selective action exhibited by the enzymes either in effecting fermentation or in producing hydrolysis.

Pasteur was the first to show that a solution of racemic acid becomes lævo-rotatory in presence of penicillium, owing to the destruction of the dextro-tartaric acid by the fungus—an observation which has been frequently utilised in the attempt to isolate one of the optically active constituents of a racemic compound.

Configuration and Alcoholic Fermentation.—This selective action is exhibited in a very marked degree by the beer yeasts in producing fermentation of the carbohydrates. Of the eleven known aldohexoses (glucose type) only the three natural products are fermentable, viz. dextro-glucose, dextro-mannose and dextro-galactose, and of the ketohexoses only dextro-fructose is decomposed.

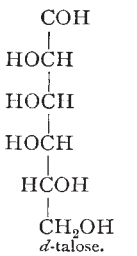
All the yeasts susceptible of inducing fermentation transform dextro-glucose, mannose and fructose with about equal velocity; but the action of yeast on dextro-galactose is slower, and certain species—*Saccharomyces apiculatus* and *productivus*—are totally without action upon it.

A comparison of the configuration of these four sugars will exhibit the differences in molecular grouping.



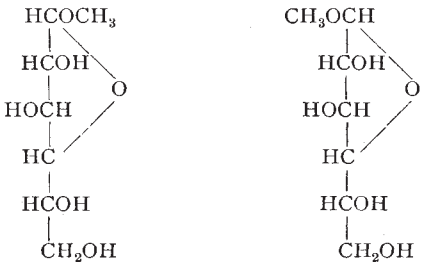
d-glucose. *d*-mannose. *d*-galactose. *d*-fructose.

In glucose, mannose and fructose the grouping of the H and OH round the three lower asymmetric carbon atoms is the same, but differs from that of galactose, a fact which may account for the slower fermentive action of the latter. The other hexoses are not fermentable. The small difference in configuration which suffices to arrest the action is seen in the case of *d*-talose, which only differs from *d*-galactose by the position of one hydroxyl group.



d-talose.

Configuration and Zymolysis of the Glucosides.—By the combination of glucose with methyl alcohol, to form methyl glucoside, a new asymmetric carbon atom is created, and consequently two stereo-isomeric derivatives are possible. E. Fischer has obtained from *d*-glucose both modifications, which he terms α and β methyl *d*-glucosides, also the corresponding α and β methyl *l*-glucosides and similar products from the other aldoses. Fischer has allotted to the α and β methyl *d*-glucosides the following formulæ.



An aqueous solution of the emulsin of bitter almonds hydrolyses the β modification, but has not the least action on the α modification. Exactly the reverse happens with an aqueous extract of dry yeast. In this case the α compound is hydrolysed, whilst the β modification remains unchanged. The ethyl and phenyl glucosides, which are only known in one modification, behave like the α methyl compound, and probably belong to the same category. Neither emulsion nor yeast affect the two methyl *l*-glucosides.

D-galactose forms two methyl derivatives, one of which is attacked by emulsin and the other by the enzyme of yeast, but more slowly than the corresponding glucosides, the difference in rate corresponding with that observed in fermentation. Neither methyl *d*-mannoside nor methyl *l*-mannoside is attacked by emulsin or the enzyme of yeast. The second *d*-mannoside, which would probably be hydrolysed by one or the other ferment, is still unknown. The pentoses and heptoses are non-fermentable, and their methyl glucosides are likewise indifferent to both enzymes.

The following is a list of natural and artificial glucosides. The action of the enzyme is denoted by a + when it produces hydrolysis and by a − when it is without action.

		Artificial glucosides.	Emulsin.	Enzyme of yeast.
Aldosides.	Hexosides.	α methyl *d*-glucoside ...	−	+
		β methyl *d*-glucoside ...	+	−
		α methyl *l*-glucoside ..	−	−
		β methyl *l*-glucoside ...	−	−
		α ethyl *d*-glucoside ...	−	−
		phenyl *d*-glucoside ...	+	−
		α methyl *d*-galactoside ...	−	+
		β methyl *d*-galactoside ...	+	−
		methyl *d*-mannoside ...	−	−
		methyl *l*-mannoside ...	−	−
		methyl arabinoside ...	−	−
		α methyl xyloside	−	−
		β methyl xyloside	−	−
		methyl rhamnoside ...	−	−
		methyl gluco-heptoside ...	−	−
	Ketosides.	methyl sorboside ...	−	−
		methyl fructoside (not crystallised)	−	+